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FRONT COVER

A European-Made Tractor

This year, Europe expects to manufacture 210,000 farm tractors. (Photo by Dr. Montell E. Ogdon.)

BACK COVER

Map Showing the Number of Tractors on Farms in ERP Countries

On January 1, 1949, the number of farm tractors in the countries participating in the European Recovery Program had increased more than 200 percent over the prewar figure.

NEWS NOTES

Mr. McClure Returns From Latin America

F. A. McClure, OFAR Field Service Consultant on Bamboo, returned to Washington recently from Latin America where he spent 2½ months in field work connected with the development of the bamboo program in collaborative agricultural stations.

Under the auspices of the Instituto Agropecuario Nacional, Mr. McClure supervised the establishment of a 20-acre experimental field planting and a 2-acre experimental nursery planting of bamboo in Guatemala, and, in collaboration with the Federal Experiment Station of Mayaguez, P. R., set up experiments in the propagation of bamboo plants of small size for shipment by air express.

ICB Official Back From Europe

J. B. Gibbs, Head, Division of Tobacco and Tropical Products, International Commodities Branch, OFAR, returned recently from Europe where he discussed with ECA and OEEC representatives requirements for American tobacco. He also conferred with United Kingdom officials regarding the 1949 and long-term plans of that country on tobacco importation and consumption.

Mr. Milam Joins OFAR Staff

Ford H. Milam has been assigned by the Office of Foreign Agricultural Relations to take charge of agronomic investigations at Central Nacional de Agronomía, the agricultural center at San Salvador operated jointly by the United States and the Republic of El Salvador.

Mr. Milam has for several years been engaged in agricultural research and extension work in the United States and the Far East. During the war, he was Military Government officer in charge of agriculture on Okinawa. For the next 3 years, he was Director of Experiment Stations and advisor to the Agricultural Improvement Service in South Korea.

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Agricultural Mechanization And Europe's Economy

by **MONTELL OGDON**

Countries participating in the European Recovery Program expect to produce 210,000 tractors this year. They will export a good many two-plow wheel tractors and import, as finances permit, to make up their deficiency, largely in other types. They are keenly aware of the efficiency that has been brought into the agriculture of the United States through mechanization, and they consider increased mechanization of their own agriculture as being of high importance to their economic recovery and development.

Are these countries on the right road in pursuing such plans? Both agriculture and industry of the United States, in search of information, have raised the question. The United States Government during the last year, therefore, has been studying agricultural conditions and needs of the ERP countries. One of the groups engaged in this task was the special United States Farm Machinery Survey Mission, which has just concluded its report.

That group reports that there is a real need for farm machinery in the ERP countries. It finds that farm mechanization can bring about more efficient utilization of land resources in such countries through:

1. Addition of some land to the present farm area by reclamation.
2. Shifts from permanent grass to cropland.
3. Shifts to crops that produce more food per acre.
4. Improved methods and timing of operations, such as plowing, tilling, seeding, fertilizing, spraying, and harvesting.

The question of European farm mechanization has been of special interest to the United States since the end of the war. For one thing, United States farmers who have not received delivery on machinery have been wanting to know whether the machinery being sent to Marshall Plan countries is being used efficiently and whether it is being used to increase food production. Behind such queries is uncertainty as to whether European farms lend themselves to efficient mechanization. Another question undoubtedly in the minds of many people in the United States is that of the effects of mechanization on the European market for export commodities produced in the United States, such as wheat, livestock products, and fruit.

Members of Congress also have raised questions on Europe's aim of greater farm mechanization. Before Congress was willing to make the 1949 appropriation for the ECA farm-machinery program, it wanted a full explanation of the farm-machinery situation in both the United States and Europe. It wanted assurance

Machinery played a vital role in Europe's 1948 harvests.

among other things that farm machinery exported from the United States under ECA would be sent to places where it was needed and would be of a type suitable for local conditions.

European Planning

Europeans, though no longer threatened by starvation, still are highly food conscious. The fact that they have been through critical periods of food shortages—and still are short of food—is influential in causing their governments to seek increased domestic production. Plans presented to the Organization for European Economic Cooperation envisage increased farm output and mechanization and adoption of other improved farming practices as vital parts of their recovery and development programs.

Data compiled by the OEEC Committee on Food and Agriculture indicate that ERP countries generally plan to reduce draft-animal production, increase meat animal and dairy production, and at the same time further expand food-crop acreage. Of 10 countries that have reported their long-term plans to OEEC, 9 hope to increase acreages of bread grains by 1952, compared with the 1948 figures. Eight countries also plan, for the same period, increased acreages of feed grains, and most of them anticipate larger acreages of sugar beets and fodder roots.

Increased yields per acre also are planned by countries participating in the OEEC meetings. By 1952, expansion of about 20 percent over prewar bread-grain yields is anticipated by Denmark, 28 percent by France, 31 percent by Greece, 9 percent by the United Kingdom, 8 percent by Turkey, and 7 percent by Italy.

Mechanization is a part of this European plan to increase both acreages and yields of leading food crops. The OEEC subcommittee on agricultural machinery has found three reasons behind the urge to mechanize. These are (1) realization of the importance of machinery in improving output, (2) desire by farmers to reduce costs, and (3) necessity of solving the labor problem. The subcommittee is promoting the closest cooperation between research institutes in various countries with a view to obtaining the fullest possible exchange of ideas and information, particularly those relating to producing machinery that will improve farm output, save manpower, and reduce farm production costs.

A number of European conferences, held late in the summer and in the autumn of 1948, considered problems relating to modernization of European agriculture, including mechanization. Among these were the Utrecht Conference on Horses; the sessions of the Ad Hoc Committee on Agricultural Problems of Common Concern to the Food and Agriculture Organization and the Economic Commission for Europe, at Geneva; and meetings on technical agricultural machinery problems, held in Lausanne following the Geneva FAO-ECE sessions.

The Utrecht Conference recommended that the FAO convene an international meeting as soon as possible to undertake a thorough investigation of the economic position of horses in European agriculture and to find methods of utilizing horses most profitably. The FAO-ECE Ad Hoc Committee in Geneva recommended that investigations be made of steps European countries are taking to use most effectively all available draft power and of methods for insuring the best use of tractors and attachments. The committee found that, although draft animals now exist in some countries in excess of prewar numbers, mechanization is further reducing the number needed and land is idle in other countries for lack of draft power.

In following up these recommendations and findings, the ECE has attempted to obtain better distribution of farm machinery spare parts, and the FAO has considered possible incentives that will encourage farmers to release surplus horses. Consideration is being given to the possibility of organizing an international trade in horses to aid their movement between surplus and deficit areas.

FAO and ECE are taking steps to assure all types of essential materials for agricultural production, including farm machinery, tractor fuel, fertilizers, insecticides, and feedstuffs. FAO, for example, is giving consideration to both broader and new uses for chemicals in agricultural production, and is working with appropriate committees of ECE on fertilizer, insecticide, and weed-killing chemical requirements. This enables ECE technicians, working closely with the chemical trade, to have the point of view of agriculture as well as of industry. Long-term problems of interest

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Dr. Ogdon is Regional Specialist and Acting Head, Agricultural Machinery and Supplies Division, International Commodities Branch, OFAR. During the past 2 years he has spent 10 months in Europe, visiting most of the countries participating in the ERP. He was United States Observer at the OEEC farm-machinery meetings in Paris, July and October 1948; the United States Delegate to the Joint FAO-ECE meetings in Geneva, September 1948; and a member of the United States Farm Machinery Survey Group that visited ERP countries, October–December 1948.

Powerful U. S. tractor plowing hard, dry ground in North Africa.

to European agriculture, including the standardization of drawbar hitches on tractor implements and adaptation of machinery to the needs of small and medium-size farms, are being worked on jointly by the two organizations. They are keeping in close contact with the International Technical Center of Agricultural Machinery and the Farm Machinery Section of the International Commission of Agricultural Engineering.

European agricultural leaders and technicians are committed to the mechanization of European agriculture. Theirs is not an easy task. But they are beginning to work out the solution of the problems involved in mechanization and to exchange information that has proved useful in one or more countries. They recognize that modernization requires more than machinery. It also requires better seed, more and better application of fertilizers and insecticides, and modernization of other phases of their national economies.

Is Mechanization of European Agriculture Practicable?

The United States Farm Machinery Survey Mission, which went to Europe early in October 1948 and returned just before Christmas, reports that European agriculture is suitable for mechanization. This committee, made up of specialists in the various fields of agriculture, with a Land-Grant college man as chairman, a Nebraska farmer, a machinery specialist, and agricultural economists, went to many farms and into repair shops in gathering its information.

In making the survey, the Mission took into consideration such physical conditions as water and land resources and soil types, economic and management problems, farming customs and practices, and other factors that affect the use of farm machinery in the countries participating in the ERP. The Mission found that mechanization of European agriculture was going on and might be expected to continue. In all countries, it found farms that were highly mechanized and others that lend themselves to mechanization. Europe does have many small farms, but there are also numerous medium-size farms as well as large ones that can be efficiently mechanized. The large number of tractors being used efficiently on farms in the participating countries is evidence in itself of the practicability of mechanization. (The map on the back cover of this issue shows the density of tractors in relation to cultivated land.)

The American type of all-purpose wheel tractor, known as the two-plow row type, is found suitable for the kinds of crops and farms found in Great Britain, Ireland, the Scandinavian countries, the Benelux countries, the important farming sections of France, and certain areas of the other participating countries.

The demand for the lighter two-plow tractor is being met largely by production in the United Kingdom, while France and certain other countries are also becoming important sources of supply for various types. One- and three-plow all-purpose tractors are badly needed and would suit European conditions in some cases better than the lighter two-plow types that are being produced within the Marshall Plan area of Europe. The demand for both the 10-horsepower and the 30- to 35-horsepower class of tractors is strong, and production is being planned or is already beginning in different places in Western Europe.

Many farms in Europe resemble farms in the United States with respect to types and use of equipment. Grain farmers in the east-central part of England and in north-central France utilize the same kind of equipment for draft power, plowing, disking, and combining as is used in the midwestern United States. The Dutch or Danish farmer may have need for a slightly heavier row-crop type of tractor because of the large amount of root crops he grows, and the farmer in the Mediterranean area wants still more power because of the harder and drier soil. In North Africa and Turkey, both wheel- and crawler-type tractors are needed for heavy plowing and drawing large combines.

Machinery on the types of farms mentioned above is definitely suitable for the local conditions. It increases the yields by providing more timely operations and better preparation of land. It is used as many hours per year as similar types of machinery in the United States. Competent operators in sufficient numbers are available. The number of repair shops has been expanded, and new shops with modern equipment are being established.

Mechanization of European agriculture is changing many established customs long considered characteristic of the small European type of farm. Farmers are buying up land or joining machinery cooperatives to make the use of machinery economical, despite their small fields. Some of the small open ditches, once considered essential to the drainage of the Dutch polder, are being filled or are being replaced by tile ditches so that mechanized draft power can be used. New orchards are being planted with a wide space between trees to permit the use of larger spraying equipment. Pick-up balers, grass and grain dryers, and vegetable spray rigs are being built to facilitate larger-scale farm operations.

Increased use of machinery has noticeably reduced the requirements for the large amounts of farm labor that formerly characterized European agriculture. It has helped to make up for the farm-labor deficiency resulting from labor losses during the war and for the shift of labor from farm to industry. This is particularly true in the United Kingdom, Denmark, the Netherlands, Belgium, and France, and to a lesser extent in Morocco and Turkey.

European countries, however, still must use large amounts of labor in root-crop production, vineyards, and haying. Picking up and loading root crops is still done by hand. Potato producers, however, have saved a great deal of labor by using various types of potato diggers. Segmented planting of sugar-beet seed has made a beginning. Growers of sugar beets are trying out many types of beet diggers with the view to finding more satisfactory machinery. Side-delivery rakes and pick-up balers are very much in demand in order to make possible the harvest of more hay and the sale of more baled straw for industrial use.

Importance of Farm Mechanization

Farm machinery of the countries participating in the European Recovery Program is proving to be an important factor in putting the agriculture of these countries on a more productive and more efficient basis. It has helped to make up for shortages of farm labor. It made possible the saving of a large harvest in 1948 despite a short harvest season and interruptions by adverse weather. It has been a factor in starting improved farm-management practices that will reduce farm production costs.

Continued farm mechanization, properly carried out, will help place European agriculture on a more productive and sounder economic basis. An agricultural economy that uses unnecessary amounts of labor, which could be employed productively in other industry, is a handicap to the development of both agriculture and the economy as a whole. Increased use of farm machinery can release more labor for nonagricultural production. At the same time, horses and other draft animals can be further reduced in numbers as mechanization becomes effective, resulting in transfer of acreage to increased production of food or diversion of feedstuffs to production of livestock products much needed in the European diet.

A European economy that produces efficiently and that produces what it can to best advantage will have a larger urban population than it has now and a larger demand for fruit, dairy products, and such animal-protein products as eggs and meats.

ERP countries prepare their youth for farm mechanization by conducting training schools. (Adana, Turkey.)

A Tropical School Garden

The policy of the United States Government, in the words of President Truman, is to make "the benefits of our scientific advances and industrial progress available for the improvement and growth of underdeveloped areas." How this Good Neighbor policy is being carried out among the young future citizens of a community in Peru is told in the following article.

by **GEORGE A. WOOLLEY**

Victory Gardens and Freedom Gardens are well known to boys and girls of the United States, and home gardens were grown by their parents and grandparents before them. But down in tropical Tingo María, Peru, boys and girls are learning gardening as a new and exciting art—thanks to cooperation between the Government of Peru and the United States Department of Agriculture.

Tingo María is the site of a cooperative agricultural station, established in 1942. Important research and extension work is being developed at the station, especially with regard to those export commodities for which there is a sound market in the United States. A community of good size is growing up at Tingo María. Oddly, however, home gardens have seldom made their appearance. Residents have doubted their ability to produce home-grown vegetables in that Amazon foothills area with its high temperatures and heavy rains. The common practice has been to bring in vegetables by truck from Huanuco, 80 miles away, or to go without.

Fortunately, at the time this story begins, the Horticultural Department of our Estación Central had completed enough experimental work to show that the production of many home gardens at Tingo María is feasible. We took this initial research and turned it into a three-way gain for the community:

First, in searching for a project to begin extension work among a group of boys in the Tingo María school, gardening showed up to be the most suitable.

Second, a garden project would give opportunity to try out some of the crops not known to the area.

Third, we were aware of the old extension principle—to get an idea across to the old folks, start by showing the young ones.

In April 1948, we began clearing a small patch of tangled jungle growth of about 5 acres adjacent to the town of Tingo María and close to the school. The task seemed hopeless. We had planned to have the garden ready for seeding by the time school began in April, but we were faced with a labor shortage.

By the middle of May, however, the growth had all been cut and was wilting and drying. Since from that time on, no more hand labor was available from the station, the school boys began doing it. We did have the use of a small tractor with a bulldozer and plows and a disk harrow. With the tractor and bulldozer the drying material was pushed into windrows. The large stumps were dug by hand. One large but no longer usable drain ditch that traversed the land was covered. After the windrows were burned, the ground was plowed, leveled, and prepared for seeding.

Planting began on June 24. By this time a number of the boys, particularly those from 12 to 16, had become quite enthusiastic about the project.

Local colonos had thought that good lettuce could

School boys of Tingo María learn to use modern garden tools.

School girls of Tingo María learn about flower gardening.

not be produced around Tingo María. This, in spite of the fact that the crop had been successfully produced at the station. The school garden convinced them that they were wrong. The boys set out surplus lettuce plants from the station in checked rows and shaded them with banana leaves until they became established. Transplanting lettuce from germination beds was not being recommended as a practice, but the boys wanted to be sure the trial was a success. The results were amazing, and the plants grew into big leafy heads in a short time. The Tingo María housewives began to call at the garden regularly for garden produce as did the station wagon for the Hotel de Turistas and a delivery route by jeep was established to the restaurants in town.

Lettuce transplanting was quickly followed by lettuce seeding along with the radishes, turnips, tomatoes, and cucumbers. Germination beds were set out for red and green cabbage, cauliflower, and eggplant. Tomatoes were planted in a number of flats. Besides the seed and plants that were furnished by the station, vegetable seeds, imported from southern United States by OFAR, were used.

Planting continued as fast as the group was ready and the patches laid out. These additional plantings included broccoli, kale, collards, red beets, okra, sweet corn, beans, sweetpotatoes, and peanuts.

Although many of the vegetables were used in the boys' homes, they seemed to be quite interested in selling the products, and a number of them turned out to be excellent salesmen. Cash receipts were cared for and administered by Sr. Bartra who was assisted by three or four of the boys who did much of the bookkeeping. By December the project had given them an income of about $200, and sales were still being made. Proceeds from the garden financed a trip for 39 boys and 3 instructors to schools in Huanuco, and they still have money in the bank.

All the time this garden work was going on, the girls in the school were enviously watching. They were carrying on extension projects in clothing construction under the guidance of Srtas. Rosa Valdivieso and Rosa Santillon, who are leaders in the extension domestic science program at the Estación Central. But the girls wanted a garden too.

A small plot of ground in the schoolyard was plowed, therefore, and a seedbed prepared for a flower garden. Seeds and plants used were collected from the adjacent territory. The girls have shown that their garden was not just a fad or fancy but an excellent selection of flowering and decorative plants.

From a small beginning then, the Tingo María school garden has had a number of beneficial and far-reaching results:

Some 75 or 80 boys have learned how to prepare land properly for seeding; how to build a fence; how to make the best use of tools and equipment available; something about the use of power equipment; the adaptability of garden seed varieties; how to plant, care for, and harvest garden products; methods and materials for control of insect pests and diseases; how to prepare garden produce for market; the business of marketing and keeping records; cooperation to get a job done; and the nutritional value of garden products in their diet.

The boys have demonstrated to others, including many colonos, the feasibility of growing a home garden in the zone of Tingo María.

Other interesting sidelights, which may later form the basis for experimental study, were in connection with the adaptability of some of the crops to the zone. Melons, for example, did not produce enough to warrant the use of the land, while cucumbers were excellent. Broccoli made a rapid woody growth and dropped most of the leaves. Chantenay type of carrots were earlier, higher yielding, and of better quality than the Nantes type, although the quality of both groups was rather low. Red beets showed a tendency to grow the roots more than half above the ground. Tomatoes, radishes, kale, collards, sweet corn, beans, cucumbers, and okra grew well.

The Tingo María school garden was an interesting experience and working for and with Peruvian young people is definitely a pleasure.

Mr. Woolley is Extension Specialist, Estación Central de Colonización en Tingo María, Peru, Technical Collaboration Branch, OFAR.

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Food Supply in India

India's latest harvest was favorable, but this is not enough. The population is increasing by nearly 4 million every year, and efforts to expand food production are not yet keeping pace.

by **CLIFFORD C. TAYLOR**

India is faced with the serious problem of increasing its food supply as fast as its population grows. This is not easy. The soil is less fertile than the people. Nitrogen, phosphate, and organic matter are generally deficient. Rainfall in most regions is negligible most of the year and in the northwest practically all of the year. Irrigation has been practiced to an increasing extent during the past half century, but there is still not nearly enough. Improved seed has yet to gain general adoption. Much scientific research has been and is being done in India, but illiteracy and prejudice impose a wide gap between knowledge and practice that must be bridged.

India's crop yields per acre are pitifully low. For example, the production of the eight principal food grains in 1947–48 was 43 million long tons [1] from 173 million acres. The United States, by contrast, produced 125 million long tons of wheat and corn in the same crop year from 157 million acres. India averaged 0.25 ton per acre; the United States, 0.80 ton, a yield more than threefold that of India. For wheat alone the Indian yield averaged 0.26 ton; the United States, 0.48; India's figure for corn was 0.27 as compared with 1.07 tons in the United States.

Despite these low yields, India has 337 million people to feed. Its population is assumed to be increasing at the rate of nearly 4 millions annually.

Because of India's low production, no more than 10 or 12 ounces of food grains per person per day are available—about 1,000 or 1,200 calories. A 12-ounce grain ration for 337 million people throughout the year would require 41 million tons of food grains. Allowance for seed requirements and unavoidable waste would increase this figure to 50 million tons.

In 1947–48 (as officially reported) India produced only 38.4 million tons of food grains.[2] When the

[1] A long ton is 2,240 pounds.

[2] Another 1½ million tons should be added if allowance is made for the official method of estimating rice production. The weighted average of hand-milled and machine-milled rice is 70 percent of rough-rice weight, whereas 65 percent is actually used as the conversion factor.

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following are added, however, the total tonnage available for food was at least 53 million: 4.3 million tons of gram, or chickpeas, officially reported; about 3.6 of other pulses, unreported during recent years; possibly 4 of all kinds of grain produced in Kashmir and other nonreporting areas; and imports approaching 3 million tons.

Food-grain production as officially reported may be less than actual production. The system of crop reporting, at least in areas where estimated yields are not checked against field tests, lends itself to some underestimation on the part of tenants who fear their rents will be raised and landlords who fear their land tax may be increased at the next periodic "settlement" of land-tax rates. This tendency is minimized by the Provincial Governments' practice of appointing village patwaris from outside the village where they are to serve as recorders and assessors. Nevertheless reported figures are probably low. It is particularly significant that yields and production have been officially reported at a distinctly lower level during the past 3 years since compulsory procurement of food grains has been in force. Officially reported production of these grains in continuously reporting areas has been 3 or 4 million tons below the level formerly reported.

While the total consumption of food grains and pulses may be taken to be somewhat more than 12 ounces, the ration available to urban consumers who are dependent on the Government's ration shops has at times during the past year been as low as 6 ounces. On the other hand, about three-fourths of the people are agricultural producers and are therefore mostly, if not entirely, independent of Government rationing except insofar as they are subject to compulsory procurement. Their consumption level undoubtedly averaged considerably more than 12 ounces of food grains.

In assuming 12 ounces of grain to be equal to 1,200 calories in the diet, little allowance needs to be made for bran or husk. The extraction rate of flour is as high as 95 percent. In the preparation of atta (ground wheat), little of the kernel is removed. Hand-milled rice, representing three-fourths of all rice, has little bran removed.

Other foods brought the consumption far above the 1,300-calorie level represented by food grains alone. In addition to the production of at least 53 million tons of food grains and pulses, India produced 5.3 million tons of *sugar* (in terms of gur, or unrefined sugar). This sugar, even after deducting small exports, would provide calories equivalent to an equal tonnage of grain. Edible oilseeds, mostly peanuts in the shell, amounted to 4.6 million tons, of which the unexported portion provided *oils* equaling, in calories, almost 3 million tons of food grains. From previously published data, it may be deduced that about 65 million cows and milking buffaloes produced about 20 million tons of *milk*, mostly buffalo milk of high butterfat content. In terms of calories, this would represent the equivalent of at least 4 million tons of grain. These three items—sugar, vegetable oils, and milk—add about 350 calories to the diet. Vegetables, fruits,[3] fish, meat (especially mutton), poultry, and eggs are probably sufficient to bring the dietary level up above 1,800 calories.

In judging the adequacy of an 1,800- or 1,900-calorie diet in India, as compared with around 3,000 calories in the United States or Canada, it is necessary to note that the 3,000-calorie level has been calculated at the stage when it enters the kitchen. Beyond that stage there is much greater waste in the American kitchen or on the American table than there is in an Indian home.

The plain fact remains, however, that the consumption level is dangerously low. For the urban working classes this is particularly true. A break-down in the distribution system, coupled wth a series crop failure in any region, would bring about another disastrous famine. The Bengal famine of 1943 occurred in a year when food-grain production was 5 million tons more than that of any of the past 3 years, as officially reported.

Food Outlook, 1948–49

India's food supply during the year, beginning August 1, 1948, is not likely to be better than during the past year. Weather conditions last summer, especially the excessive rains, were unfavorable for the production of good crops of jowar, or grain sorghums, bajra, and corn. These crops would normally amount to about 10 million long tons or nearly one-fourth of the total reported food-grain production. The autumn and winter rice crops, however, are believed to have been good. Rice production normally amounts to around 19 million tons, and it supplies somewhat less than half the total food-grain production. Growing conditions for winter-sown wheat and

Mr. Taylor is Agricultural Attaché, American Embassy, New Delhi, India.

[3] Undivided India produced 4.7 million tons of vegetables and 10.7 million tons of fruits.

gram are favorable. Crop estimates may show increased acreages of these crops as a result of their being sown on land that could not be seeded to summer-grown crops because of excessive rains earlier in the year. Moisture reserves in northern India are generally ample to produce good wheat and gram crops. The only area seriously affected by drought is that around the Saurashtra and the northern Bombay region, but this area is relatively unimportant in the national food-supply picture. A less serious rainfall deficiency is developing for the second consecutive year in southeast Madras.

Compulsory procurement, discontinued a year ago, is being resumed as rapidly as harvest seasons for the various crops begin. Rationing for the urban population will become more general when the Government acquires sufficient stocks, especially after the winter harvest of rice. It will be almost a year, however, before rationing can be restored as generally as it was when decontrol was attempted a year ago.

Import requirements once again will be large, between 2½ and 3 million tons. Purchases include 510,000 tons of wheat from the United States and 385,000 tons from Argentina. Jute and tea have been used for bargaining purposes. The quantity of rice that will be obtainable from Siam and from turbulent Burma is problematical.

Food-Grain Production, 1947–48

More than four-fifths of India's crop acreage is devoted to the production of food grains. The 1947–48 yield of the eight principal food grains was about 1.5 percent greater than in the preceding year.[4] This gain about equaled the estimated increase in population. In fact, if gram is omitted, there was an actual decrease in production. The smaller yields of certain grains, chiefly rice, more than canceled the higher production of wheat and jowar.

The slight increase in the production of food grains was primarily the result of favorable weather in wheat- and jowar-growing areas where extremely poor yields had been obtained in 1946–47. It was not caused by increased acreage. On the contrary, there was an over-all decrease of 8.1 million acres—4.5 percent. Wheat accounted for the greater part of the decrease—4.1 million acres. This was chiefly the result of discouragement and lack of seed wheat after the preceding season's losses from rust. The mass migration from East Punjab, which occurred at wheat-seeding time, also contributed. For various reasons, such as the lateness of the monsoon rains in 1947, there were other decreases in food-grain acreage. The only notable increase was in gram, 1.5 million acres. This increase probably resulted from the use for this crop of land that was not all planted to such summer-grown crops as jowar and bajra because of the lateness of the monsoon rains.

[4] All comparisons apply to the Indian Union as comprised since the separation of Pakistan in August 1947.

Rice provides nearly half of India's grain supply and generally is harvested by hand.

Efforts to Raise Production

The necessity for increasing food-grain production has been stressed in a succession of Government committee reports, especially since the 1943 Bengal famine. One result was the inauguration of the Grow-More-Food campaign, under which the growing of cotton and tobacco was restricted, annual food-production goals for each Province were set, and Central Government funds were allotted to cover half the Provincial costs of specified measures for increasing production.

The official statistics, if taken at face value, show no lasting stimulation of production resulting from the Central and Provincial Governments' efforts. Repeated acreages of food grains in Provinces and States rose from 156 million in 1941–42 to 170 million in 1944–45. In the latter year, however, several States began reporting acreage planted to jowar, bajra, and corn. Again in 1946–47, several additional Provinces and States commenced to report ragi, barley, and gram. The larger food-grain acreages reported in recent years, therefore, are entirely the result of the inclusion of these figures, amounting to 18 or 19 million acres. Omitting these additional figures, the combined acreage of food grains in the originally reported areas declined to 155.6 million acres in 1947–48.

It had been assumed that the Grow-More-Food

campaign would bring about a major shift of acreage from cotton to food grains. The official estimates indicate that between 1941–42 and 1944–45 cotton acreage fell by 9 million acres, while food-grain acreage (eliminating new reporting areas) rose 13 million. In addition, oilseeds rose more than 4 million, making an over-all increase in food crops of 8 million acres.

Between 1944–45 and 1947–48, cotton acreage continued practically unchanged at the reduced level. Food grains, however, declined 13.5 million acres, bringing down the acreage planted to these crops (again eliminating new reporting areas) to about the 1941–42 level and lowering the combined acreage of all the principal crops to a level of 6 million acres, or 3 percent, less than the 1941–42 figure.

Population during these 6 years increased possibly 25 million, or 8 percent.

TABLE 1.—*Food-grain production in India*[1]

Years	Acreage	Production	
		Total	Per acre
	1,000 acres	*1,000 tons*	*Tons*
Average, 3 prewar years	159,324	43,478	0.27
1939–40	156,074	43,073	.28
1940–41	156,423	42,104	.27
1941–42	156,122	40,809	.26
1942–43	164,440	44,920	.27
1943–44	166,896	45,444	.27
1944–45	169,567	43,632	.26
1945–46	164,901	39,418	.24
1946–47	164,710	39,596	.24
1947–48	155,624	39,931	.26

[1] Only figures from continuously reporting areas included.

Sugarcane acreage has fluctuated between 3 and 4 million acres during the past few years. It was highest in 1940–41 and lowest in the next 2 years. During the past 5 years, with one exception, acreage has been slightly above 3.5 million, reaching 3.8 million in 1947–48.

At 1.4 tons of sugar (gur) per acre, sugarcane produces much more food on an acre than any other crop grown in India. Production this year appears to be good. It should be at least as large as that of last year.

About 3.5 million tons of peanuts (in the shell) are grown on about 10 million acres, usually in or near the cotton-growing regions of Bombay, Hyderabad, and Madras. During the past 4 years, peanuts have replaced cotton on 2 or 3 million acres. In Hyderabad, peanut acreage dropped in 1947–48; but this was only temporary, the result of Hyderabad's political difficulties with India.

Although there may be some expansion in areas that cannot grow the much-needed longer-staple cotton, peanut acreage would be expected to decrease if and when the heralded increase in acreage of better-staple cotton materializes.

Other edible oils produced include sesame, rape, and mustard. More than a million tons of these oilseeds are grown.

Possibility of Expanding Acreage

Although India is always confronted with the problem of keeping its expanding population, now 337 millions, above the famine level, there is a vast area of land that is not cultivated and, for the most part, is not cultivable because it is mountainous or semi-desert.

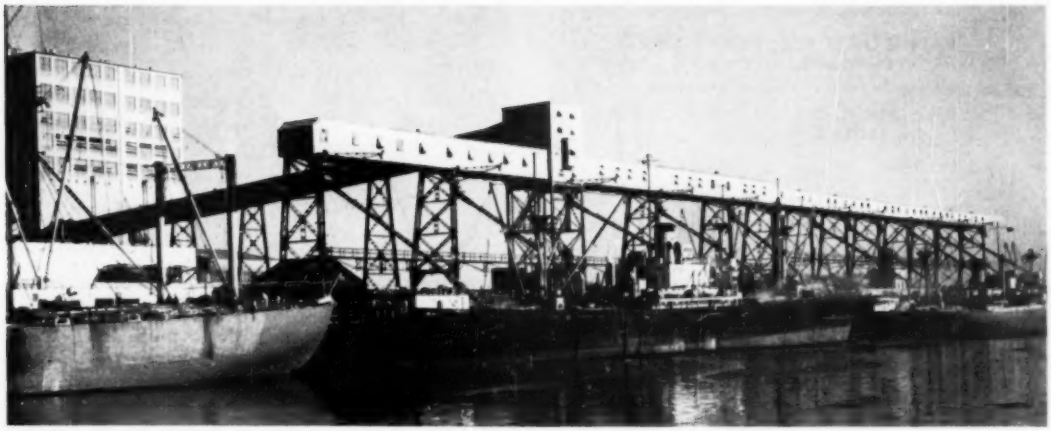
A great deal of uncultivated land, however, could be brought under cultivation. Some of it was once farmed but abandoned because of malarial conditions. Some land is uncultivated because it is susceptible to floods and some must be irrigated.

The Government's Foodgrain Policy Committee has outlined plans to increase annual food-grain production by 10 million tons. This projected increase was itemized as 3 million tons from existing food-production plans, 4 million from land irrigated from the new multipurpose storage dams, and 3 million from reclaimed waste lands. According to present plans the 25 multipurpose projects will be completed in 10 to 15 years and will provide irrigation for 18.7 million acres. The Committee proposed that the reclamation projects be in units of at least 10,000 acres, which would be scattered in operating units of at least 200 acres suitable for mechanized farming.

The Committee also mentioned the importance of developing deep-sea fishing and inland fisheries for food and of growing potatoes and sweetpotatoes on land not already used for producing the principal food grains.

India is trying to increase its food supply. Ambitious plans have been made for expanding production. Implementation of these plans is already under way. Fleets of reconditioned army tractors are plowing up tens of thousands of acres of waste lands. Work has started on several high dams that will enable additional millions of acres to be irrigated. Thousands of additional wells and small irrigation projects are being constructed. But it will be years before the additional tonnage of food obtained from these efforts can be measured in millions.

Meanwhile the population grows at a pace that requires an additional half million tons of grain each year.



The Changing Picture for U. S. Farm Exports

by **PAUL G. MINNEMAN**

An active export market for agricultural commodities is important to farmers of the United States. It is significant, for example, that agricultural export income during each of the past two fiscal years has averaged about $600 per farm. Since agricultural exports are of such consequence, it should be recognized that the export picture changes constantly. Overseas demand that exists today may have changed its character tomorrow.

Present export demand for United States farm products is good. Much of this demand, however, is based on a market that is supported by United States credit. When today's special types of credit cease to be extended either new ways will have to be found to increase exports or the consequence of drastically curtailed overseas markets will have to be accepted.

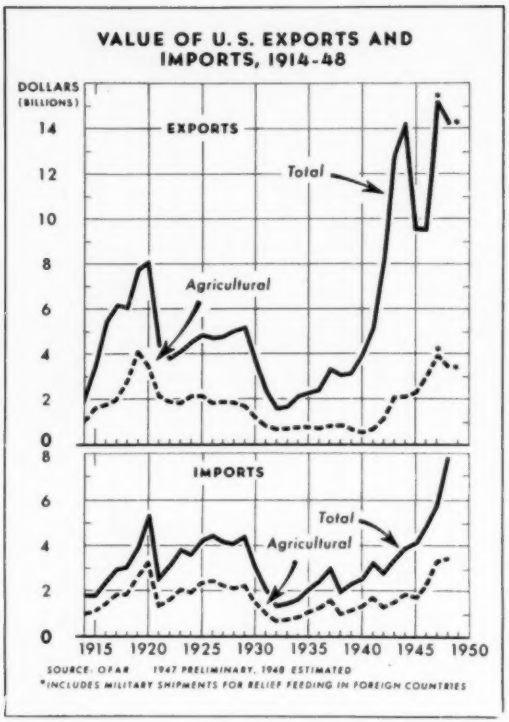
We must not fall into the habit of considering the present credit-supported export market as a normal condition. United States farmers have greatly expanded production to meet temporary war and postwar shortages, but the world supply of many products is fast approaching a balance with consumption.

In both 1946–47 and 1947–48, United States agricultural exports totaled about 3.5 billion dollars—near the all-time record of 1919–20. This figure is five times the prewar average of 1936–40, but about half of this increased value is the result of higher prices and half of larger volume. Actual volume of farm exports is about double that of prewar but only about equal to that after World War I.

More important, however, has been the significant shift in the kinds of agricultural exports. Some have fared well, others badly.

For example, cotton and tobacco, which before World War II were the two most important export products—making up more than half of all agricultural exports, last year accounted for less than 20 percent. Tobacco exports are now about equal to prewar, but cotton exports since 1940 have been at the low level of only one-third to two-thirds of prewar and only about one-fourth of the 1925–29 level. While cotton formerly made up 40 percent of the total, last year it accounted for only 10 percent. On the other hand, grain and flour formerly accounted for only 15 percent but last year made up 49 percent. Essentially, the shift has been to a sharp decline in the importance of cotton, tobacco, and fruit and to a greatly increased importance of grain, dairy products, and eggs.

The reason for the tremendously increased importance of grain, flour, dairy products, and eggs is easy to see. After the war, the first problem was to provide food to relieve starvation. Pangs of hunger of a starving man are far stronger and more urgent forces than his political ideologies and must be satisfied before he can strive for good government. Friendly and sound governments abroad are essential to United



States citizens if they want to maintain their way of life. Fortunately the United States, with its tremendous capacity for food production, could step into the breech with greater shipments of grain than have ever been made in history. The United States is now exporting about as much wheat (and flour) as it uses for food within the country. Of every 100 bushels of wheat produced, 37 are now being exported.

Europe has always been, by far, the United States' most important export market, taking before the war about two-thirds of the agricultural exports. Europe's dense population and concentration of industrial production provide purchasing power far greater than any other area of the world. The importance of some European countries to United States trade has declined; notably, of course, those in eastern Europe and to a lesser extent Great Britain. Thanks, however, to the ECA and the present large exports of grain and other food, the markets in Europe have been maintained. Latin American imports of United States agricultural products have been steadily increasing although the total is still only one-fourth to one-third as large as that to Europe.

The future of United States agricultural exports, therefore, depends primarily on the extent to which Europe can regain its purchasing power. As long as credit is provided through such organizations as the ECA, Europe will be able to purchase from the United States fairly large quantities of the most urgently needed agricultural products. When Europe's production is restored, urgent reconstruction completed, and currencies stabilized, the outlook for exports of other less basic food products also should improve. The important point, however, is that a large part of the present exports are made possible only through United States credit to those countries and therefore does not represent normal foreign trade. When the United States stops extending credit, Europe will be able to buy only to the extent that it can earn purchasing power.

How can a country get purchasing power? First, it must have a healthy economy so that its own people may have incentive not only to work and produce things but also to earn wages with which to buy things. For foreign trade, however, still more is necessary. A country must not only produce a surplus for export but it must also have a sound currency that can be accepted in foreign exchange. There are people in many countries today who want United States goods and who have plenty of local currency to pay for imports, but they cannot buy them because the United States is not willing to accept their francs, lira, crowns, or pesos, and they cannot exchange their money for dollars. As soon as a country spends much more for imports than it receives from exports, its government steps in to control foreign exchange and limit imports until it can export enough to pay for more imports.

The ECA should permit European countries to restore their production, reestablish sound currencies, and reduce trade barriers. This is essentially a repair job so that their economic machines can operate again. But even a perfect, new machine will not run without fuel, and the fuel that makes foreign trade run is the money a country can get from its exports. The more it exports, the more it is able to import. Inversely, therefore, the more the United States imports, the more other countries will be able to buy from it. In the last analysis, therefore, the United States future export market will depend primarily on whether it is willing to import.

United States total imports are regularly much smaller than its exports. Agricultural products

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account for nearly half of all imports, but these include many exotic tropical products, such as coffee, tea, cacao, bananas, pineapples, rubber, silk, and spices that are not and cannot be produced in this country. These imports do not compete directly with United States agriculture and, therefore, are called complementary. Over the years, about half of the agricultural imports have been of this type; the other half have been supplementary—products produced in this country but not in sufficient quantities to meet domestic needs. Most important in this group are sugar, hides and skins, wool, vegetable oils, oriental tobacco, winter vegetables, long staple cotton, and such dried fruit as figs and dates, plus a wide variety of other agricultural products whenever the supply and demand situation is such that it pays to import them.

The physical quantity of complementary imports has remained fairly constant from year to year except during the war when shipping space simply was not available. The volume of such imports is now about equal to prewar; in fact it has not increased since World War I even though population increased. The change in total value of these complementary imports, therefore, reflects primarily changes in price rather than in quantity.

The quantity of supplementary imports has fluctuated more widely over the years. They tend to vary with United States purchasing power or prosperity and, inversely, with the volume of its own agricultural production. During the past 2 years the quantity of these imports also has been at about the same level as before the war. In the last fiscal year their total value was 1.4 billion dollars, as compared with agricultural exports of 3.5 billion dollars. On a "per farm" basis, these imports averaged $240, compared with $600 worth of exports per farm.

Fortunately for the United States, but unfortunately for its foreign trade, there are few products that are not produced in the country. Consequently, almost any import is competitive with some producer in the United States. To find ways of increasing imports is the real challenge to everyone in the United States who is interested in exports.

To the extent that the United States fails to solve this problem it will have to be satisfied with reducing production more nearly in line with domestic consumption. This would hit some producers much harder than others. Before the war the United States exported about 40 percent of its cotton and about 35 percent of its flue-cured tobacco and is now exporting more than a third of its wheat and rice. Of its total agricultural output, however, valued at about $35 billion in 1947, the United States exported only about 10 percent. Since World War I the proportion that agricultural exports made up of total exports, declined rapidly as the country became more and more industrialized. This did not necessarily mean that agriculture as a whole has suffered, because it is only natural that as the United States becomes more of a manufacturing nation, manufactured products should make up a larger part of its exports. Increased industrial production and industrial exports have resulted in a greatly increased domestic market for its own agricultural products.

Since 1910 the population of the United States has increased 60 percent—from 92 million to about 148 million. Yet the number of people living on farms has steadily declined since 1910. Then, each person on farms had to feed fewer than 3 persons in the United States. Now, each person on farms has to feed 5.4 persons, an increase of 80 percent. During this same time the volume of total farm production also increased, about 70 percent, while the volume of farm exports now is still about the same level as in 1910.

All the increase in the market for United States agricultural products over a period of years, therefore, has been the result of the increase in domestic consumption largely because of increased industrialization and population. I point this out only to show that even if the United States does not find ways of increasing its foreign trade—both imports and exports—its farmers as a whole will still have a far greater domestic market than they formerly had, including exports. To relieve trouble spots of those products that rely heavily on the export market, however, a shift would have to be made to more so-called protective foods and livestock production, meat, dairy, and poultry products.

Loading wheat. About 1,450 cargo ships were loaded with export grain and flour in the United States last year.

Agricultural Research and Extension in the Orient

by **IDE P. TROTTER**

The American system of agricultural research and extension is being closely studied all through the Orient. During the war the leaders of those oriental nations noted with amazement that the United States, in spite of having placed so many millions of workers in war industries and the armed services, was able to keep up a production of agricultural commodities that not only fed and clothed our people better than most people throughout the world but at the same time made it possible to contribute great quantities of food and fiber to our less fortunate allies. They, therefore, are eagerly restudying the United States agricultural system in search of the golden key.

Years ago the importance of agricultural research was recognized in the Orient, and serious, rather successful efforts were made to establish agricultural colleges and experiment stations. But somehow the necessity of getting established agricultural facts from the experiment stations to the farmers had been overlooked. The leaders in the Orient had not realized that merely discovering a fact does not put it into actual practice on the farms of their nations. Wherever I went, therefore, one of the most persistent questions had to do with the organization and operation of an agricultural extension service that could help them make the most universal and effective use of the information they already had and at the same time would be in position to interpret, teach, and demonstrate new facts to their farmers as the findings were made available. This article is an attempt to tell what I was able to learn about the work being done in the Orient on agricultural research and extension as well as resident teaching. These observations were an incidental byproduct of a 4½-month study of oriental cotton production and consumption. Because of my basic mission, time did not permit me to make a thorough study of many of the incidental points noted during my travels. I hope that my general observations, however, will serve to give a fair over-all picture of the present status and future

plans of the oriental countries in the development of their agricultural educational programs.

Japan

For many years, Japan has operated agricultural colleges and experiment stations on a satisfactory scale. Usually the college is associated with a much older university in one of the large cities. It is, therefore, somewhat divorced from actual farm operation and is inclined to the more technical and theoretical phases of agricultural research. In addition, during approximately the last half century, Japan developed a number of large agricultural high schools with 400 to 700 boys enrolled in each. These students are said to receive practical instruction in actual farm work. The system has been criticized, however, as being much more nearly free labor for producing crops for faculty and school dormitories than actual constructive training in the best-known farm practices.

I saw a rather typical example of their experimental organization at the Konoshu Experiment Station some 32 miles north of Tokyo. There, on 77 acres of land, 62½ acres of which were in cultivation, they employed 247 people. Their staff was organized in 5 major divisions with many branches as follows:

1. Agronomy (crop science) with 7 branches.
2. General agronomy (technical; rotation, soil improvement, and soil management) with 5 branches.
3. Physiology and genetics (technical; cytology, X-ray, etc.) with 5 branches.
4. Agricultural meteorology with only 1 branch.
5. Agricultural engineering (farm machinery, including animal cultivation) with 7 branches.

The practices under way on that station were fairly typical of good experiment station procedure in the United States. Considerable emphasis, however, was placed on pure science as opposed to practical, everyday methods of immediate use to the cultivator.

Members of the staff at the Experiment Station were apparently competent and well-trained individuals from a strictly technical standpoint, but they seemed to have little appreciation of or interest in solving the down-to-earth problems of the average cultivator.

Shortly before the war, the Japanese seemed to have realized that they needed some means of extending the information from the experiment stations to the farms of Japan. Their method of doing this was to have the Government buy and operate 1,600 farms where Government-employed personnel on Government-owned land would demonstrate proper practices to the cultivators. The scope of this program can be appreciated when we consider that the total land area of Japan is only about equal to that of Montana. This system, of course, did not take into account the fact, well-known in the United States, that farmers do not readily adopt practices directly from government-owned and government-operated farms. Only practical farm demonstrations can reach most cultivators since government operations are regarded as impractical and too expensive for them to adopt.

The Natural Resources Section of SCAP (Supreme Commander for the Allied Powers) was given the job of trying to pull order out of the educational system of Japan, especially as it relates to agriculture. One way in which they were attempting to do this was to dispose of these 1,600 Government demonstration farms and try to find among the personnel employed on those farms a reasonably competent nucleus of persons who could be trained to do farm demonstration and extension-type work. The difficulties they were encountering in teaching these Government workers what extension was is illustrated by the following. After I talked to a group of them about how extension was organized and how a county agricultural agent worked, the questions I got had to do with what uniform the county agent wore and how many assistants he had. It is easy to see, therefore, that a down-to-earth extension program will be slow in developing among people with such philosophy and training. I think it is reasonable to expect, however, that considerable progress can and will be made in helping the best of the Japanese leaders to develop a program for putting their already known knowledge into practice in the villages and on the farms. Likewise, the research groups are gradually being led to direct their research activities more definitely toward the solution of immediate practical problems as they study the higher technical aspects of Japanese agriculture.

At the present time, there is little their research

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Best methods for preparing a seedbed are demonstrated at the Shanghai Cotton Experiment Station.

workers or ours can offer the Japanese farmer with regard to his actual day-by-day management of his soil and crops. There is a great deal that can be done to help him in selecting varieties, handling pure seed, controlling insects and diseases, and improving and expanding his methods of fertilization.

China

Since the Chinese Revolution of 1911, the Chinese Nationalist Government has consistently tried to learn from the Western Nations how they might best develop their country and its agriculture. Many missions have gone to China and have reported their recommendations. The most recent of these, which had to do with agriculture, was the China-United States Agricultural Mission, popularly called the Hutchison Mission, which reported extensively on plans for reorganizing the agricultural educational and research program for China. It proposed the development of a plan very much like that in the United States with adaptations to China.

The Chinese Nationalist Government has tried as best it could to pattern developments along the lines recommended by the Hutchison Mission. The Government has done a fair job of setting up an organization that is already started and is expected to develop satisfactorily if political, economic, and social conditions will allow it to work effectively. This has not been possible during the latter stages of the present civil war in China and may not be possible for some years ahead.

For a number of years the Government has been working toward the development of a competent staff of well-trained agricultural technicians. This is shown by the fact that there are now at least three generations of trained cotton workers on the job in China. During my 5 weeks of travel in China, I was constantly in touch with and usually traveled with representatives of the educational and agricultural organizations and was tremendously impressed with the fact that all these workers were well trained for the positions they held. In other words, in spite of all the criticism directed at the political, military, and economic problems and inefficiencies charged against the Chinese Nationalist Government, I saw no strictly political appointees in educational and agricultural positions. Due credit should therefore be given to some high officials of the Chinese Nationalist Government for planning such a program and staffing it with competent men, most of whom have been given an opportunity for training in the United States.

The Government's Agricultural Extension Commission administers the extension program. As of May 1948, there were 3,030 county, provincial, and headquarters workers in the Commission, 2,000 of whom were in the Hsiens, which are the closest parallel to United States counties. China has 3,000 Hsiens: 658 of these, or about one-fifth of the total, had extension agents at the time of my visit.

In addition to the Agricultural Extension Commission, China has two other large agricultural organizations. The first is the National Research Institute, which directs the agricultural research program throughout all parts of the country controlled by the Nationalist Government. The other, the Cotton Improvement Bureau, maintains quite a number of cotton experiment stations and cottonseed-increase farms scattered over Central and North China.

I was assured that the county agents working exclusively with cotton under the Cotton Improvement Bureau were not located in the same towns or areas as were the county agents operating under the Agricultural Extension Commission, thus avoiding duplication and extending to the maximum possible limit the services available.

These cotton county agents with whom I came in touch have charge of the multiplication of the seeds of the better cotton varieties, the handling and distribution of these seeds, the handling of insecticides and equipment to distribute them, and all those things we are now turning over to established commercial groups in the United States. Thus far, no such commercial groups exist in China. In one office that I visited, I saw what seemed to be a sort of subsidiary office, which, strangely enough, they called the Farm Bureau, where insecticides, dust guns, and other agricultural supplies, furnished to China through UNRRA, were handled and made available to

farmers. The county agent furnished instructions on how to use the equipment; the Farm Bureau sold it at a nominal cost. This was a significant indication of the soundness of the general plan on which they were working.

While I was in a cotton county agent's office interviewing some cotton farmers, another Chinese farmer came in and told the county agent about some insects that were bothering his cotton. The county agent produced a colored chart, showing six different types of cotton insects and the type of damage each does. From this chart, the insect was identified as the common cutworm. The agent then told the farmer what insecticides to secure to control it. This illustrated the fine quality of information being made available to Chinese farmers.

With this type organization and staff, I believe that much progress could be made in improving Chinese agriculture if peace and economic stability could be maintained for 10 years. Unfortunately, at the present time this seems remote. It is improbable, however, that the possibility of improving the condition of China's agriculture through properly planned research and extension activities will be completely abandoned by any government that may take over there.

India

During the many years the British ruled India, they assisted in the development of a number of agricultural schools and experiment stations, which have had a tremendous influence on the improvement of agriculture in that country. For example, at the Surat Experiment Station, which I visited, important cotton breeding work is being done. A. B. Patel, Cotton Botanist for Bombay Province, and his coworkers have succeeded in doubling the chromosome number in Asiatic cotton, thus permitting it to be crossed with American varieties. They now feel that they have some important new strains coming along from this basic research.

In various parts of India, District Agricultural Offices are maintained. Workers in these offices, like those in China, have to do a number of things that we in the United States would call commercial, but they have no other way of distributing and demonstrating good seeds and fertilizers.

At Coimbatore in south India,, we visited a large agricultural center where many types of research and teaching were being done. I was particularly interested in their remarkable sugarcane research program.

Pakistan

Pakistan's agricultural research extension program is similar to India's. It also was developed under British rule. At Mirpurkhas in the Sind Irrigation Project and at the Lyallpur Agricultural College, some practical and outstanding cotton breeding and improvement work is being done. Practically all important agricultural development and production in Pakistan depends on irrigation water. Large developments have been made and more are contemplated. Meantime, their research workers and district agricultural officers are making significant progress in improving the methods of irrigation and practices in crop production so as to reach their highest practicable efficiency.

In applying United States extension techniques to other nations, one principle should always be kept in mind. The type of work done by county agents in the United States must be adapted to and not imposed on any other nation that undertakes to secure the advantages of this type of adult education and farm demonstration. The progress that is being made in that direction, while quite inadequate, is at least encouraging. If permitted to be continued for a period of years, extension programs should prove tremendously helpful in restoring agricultural production and leading it to a higher degree of efficiency and economy. The United States should be proud of the part it has had in furnishing a pattern for this type of work throughout the world and at the same time should feel that its efforts devoted to the training of outstanding agricultural leaders for these nations have been tremendously worth while. It is my opinion that money spent in the training of such leaders, particularly agricultural leaders, will ultimately pay far greater dividends to their native country and to international goodwill and world peace than will funds spent furnishing these nations material things, many of which are unadapted to their conditions.

Barley plots at the Konosu Experiment Station in Japan; planting at the right has had fertilizer, the one on left has not.

The Migratory Locust Of Latin America

by **EDSON J. HAMBLETON**

Locusts have plagued mankind from the beginning of agricultural development. The history of devastations caused by locusts dates back to the Egyptians, the biblical account of which is familiar to us all. Human suffering and famine brought tragedy to some of the Roman colonies as early as 125 B. C. when 800,000 people died after a locust invasion. Elsewhere, throughout China, India, middle Asia, the Mediterranian countries, and most of Africa and Australia, various species of migratory locusts have long been a constant menace to man. Early American colonists, like farmers of the Old World before them, suffered from these devastating pests.

In the past few years, locust infestations have become increasingly serious in Latin America. Some progress, however, is being made in controlling them. Several of the republics have joined forces to work out control programs. New insecticides have been introduced. Small airplanes and helicopters sometimes are used to spread the poison dusts. If the pests are to be effectively controlled, however, all affected republics will have to participate in a coordinated program under which outbreaks can be predicted and steps taken to halt the locust migrations.

There are several species of migratory locusts in the Western Hemisphere. The most destructive and best known of these is *Schistocerea cancellata* (Serv.), heretofore referred to as *S. paranensis*. This species is found from southern Mexico through Central America to Argentina. Although both locusts and grasshoppers inhabit practically all Central and South America, locusts appear periodically only in certain countries within more or less well-defined areas.

In many parts of the world, outbreaks of migratory locusts have tended to increase in number and intensity as agriculture has expanded. Man has not always been successful in determining when and where outbreaks can be expected, but he has found that mass production of locusts in many instances is further promoted by his activities in the agricultural development of certain areas or regions of the earth. Evidence of this now appears in Latin America. In recent years, locust outbreaks in Argentina, Brazil, Bolivia, Peru, and parts of Central America have been among the most serious on record. Among the contributing factors were favorable climatic conditions, important to locust propagation, and the nature and extent of natural pastures and their proximity to cultivated crops.

Habits of the Migratory Locust

Locusts are much like grasshoppers in appearance but are usually larger. They are characterized principally by their gregarious habits.

The eggs of the migratory locust are elongate and oval, about the length of a grain of wheat. They are deposited by the female in the soil in egg pods containing 25 to 100 eggs. Under tropical conditions of favorable temperature and moisture the eggs hatch in 2 to 3 weeks. The young locust, or nymph, is green and resembles the parent in form. As it grows, it changes slightly in form, structure, and color. Young locusts, from the time they begin to hop around, congregate in groups or bands. When the food supply is plentiful and the temperatures favorable, they develop rapidly, molting 5 or 6 times before they become adult, with their 2 pairs of wings fully developed. In tropical and semitropical conditions, several generations may occur annually. The entire life cycle of a generation from egg to adult under average conditions is approximately 6 or 7 weeks.

When the hoppers acquire wings, they continue their gregarious habits, gathering in bands of tremendous size that may cover several square miles. Their movements from one location to another vary according to the nature of the terrain and the presence

A swarm of locusts, about to settle on cultivated crops.

or absence of food. But most important of all, migrations appear to depend largely on temperature and, perhaps to some extent, on the urge to reproduce. Swarms of locusts have been known to travel as far as 1,600 miles. Their tireless flights frequently overcome such obstacles as mountain barriers, large bodies of water, and deserts.

Locusts feed on a wide variety of vegetation. In areas where mass propagation takes place, the younger nymphs prefer grasses and thin-leafed plants. As they grow older and move about more freely, their feeding becomes more varied. When locusts swarm, they usually move into areas where there are cultivated crops. Banded together as they are, thousands upon thousands of the winged locusts settle down in fields of corn, beans, sugarcane, and similar crops, causing heavy destruction in a short time. In such areas they reproduce, depositing eggs generally on cultivated soil or on open pasture land. Mating and egg laying occur after a given period of feeding. Then the females, still banded together, deposit their cartridgelike egg masses.

Flight Movements of Locusts

There is no information on the activity of locusts from year to year in South and Central America, except in Argentina. Here, swarms of locusts leave their permanent breeding grounds in the spring and move southward. Members of the new generation of adults developed in the southern agricultural areas eventually return by various routes to the permanent breeding grounds in the north.

In the past few years, there have been more locusts in Latin America than ever before. Great swarms have entered Bolivia and Brazil. Plagues of much smaller intensity have menaced northern Peru and southern Ecuador. These locusts are believed to have originated within the countries. In Central America, permanent breeding areas exist in Costa Rica, Honduras, and possibly Nicaragua. Annually, one or more countries are menaced by swarms originating either locally or beyond their frontiers. In 1946–47, for example, El Salvador's crops were seriously threatened when swarms of locusts swept into the country. Thanks to prompt action, however, they did comparatively little destruction.

Difficulties in Locust Control

The geographical area and ecological conditions throughout the countries inhabited by migratory locusts are quite well defined and generally are similar. The rivers, mountains, and desertlike areas

Young locusts devouring vegetation.

do present handicaps, but in most breeding grounds locust control may now be practiced where it was never considered possible before. The inadequate transportation facilities and the sparse population in much of the area over which locusts range present important problems in organizing effective locust-control campaigns. Fortunately, however, these factors are not as serious as they were in past years, because of new and improved methods that are now bringing relief to farmers and assuring them that locusts can be fought successfully.

The importance of cooperation has never been fully stressed either within or among the afflicted countries. Not only should each country organize to fight locusts within its own boundaries, but it should also form an integral part of an international organization to combat such an enemy collectively. Locusts respect no political boundary. An effective international organization could and should be established to conduct its work irrespective of political boundaries. This is especially true in Central

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America where the problem affecting one republic often has its origin in another. Growers themselves must be willing to join forces to protect their own crops from destruction and to learn not to depend entirely on government action. Before control campaigns can be successful, however, farmers must have technical aid and be shown how to fight locusts. Only methods obtained from research on locust activities and control measures should be used.

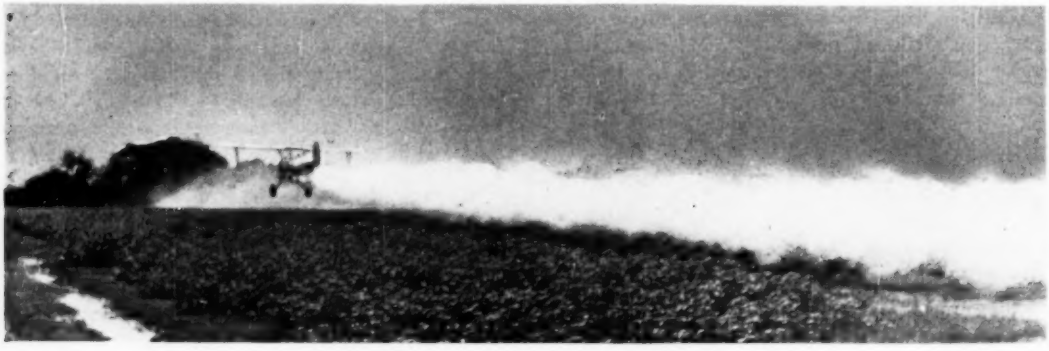
Progress Made in Recent Years

There is more active interest in the locust problem throughout the Western Hemisphere than ever before. Vital food crops threatened by destruction, the need for increased production of farm commodities, and recent improvements in measures to control locusts have all caused governments to give greater support to the organization of locust-control projects. It is also true that locusts have been more active in recent years and that new areas have been invaded.

One of the chief reasons for this interest in international cooperation are the new insecticides—benzene hexachloride, chlordane, and toxaphene—that have been so effective in killing locusts. These materials are used as dusts, sprays, or in the preparation of poison baits. They kill by contact or as stomach poisons and can be used under a wide variety of conditions. Little attempt was ever made to kill locusts with poison bait anywhere except in the United States. Earlier methods, consisting of driving young hoppers into ditches and killing them with flame throwers, were slow and costly. Thus growers have been eager to adopt new measures. Within the same year that flame throwers were laid aside, modern methods have come into use. El Salvador and Guatemala have been using small airplanes to apply poison dusts to large bands of locusts at rest In Peru, the airplane shortened the distances between isolated localities by transporting precious cargoes of insecticides to be used in baits and as dusts. Argentina is waging a large-scale control program, applying dusts by means of helicopters in areas where locusts breed permanently.

The desire to cooperate on the locust problem has been demonstrated in the majority of the affected countries. Representatives of eight Central and South American Governments signed the Inter-American Anti-Locust Agreement in Montevideo in 1946. This provided for cooperation in combating locusts appearing in any of their countries. The following year, Colombia and Ecuador took joint action when locusts invaded the latter Republic. Again during 1947, the Government of El Salvador called together representatives of Central American Governments and Mexico for the purpose of setting up an administrative organization to be placed in charge of locusts and other plagues. Ecuador and Peru have also taken the initial steps toward joint action on their locust problem.

On a limited scale, international cooperation has proved effective in solving the locust problem. There is reason to believe that the problem could be greatly simplified if all of the locust-infested republics would participate in an active program. Basic information on locust activity from each country should be obtained and coordinated from year to year, especially during the periods when locusts do not constitute a menace. Permanent breeding grounds should be discovered and mapped. With this information, organization can be more efficient. Possible outbreaks could be predicted and measures taken to organize and conduct control programs in time to prevent mass migrations of locusts to neighboring countries.



Dusting locusts by airplane sometimes is effective.

INTERNATIONAL *Agricultural News*

4–H Club Program Broadcast by BBC

The British Broadcasting Corporation recently told its listeners about 4–H Club work in the United States through the use of special recordings made during the 4–H Club Congress and the International Livestock Show in Chicago. The recordings included interviews with the International Farm Youth Exchange delegates who lived on English farms last summer under the sponsorship of the Information and Exchange Program. The BBC broadcasts were made in connection with the programs "Land and Livestock," in the General Overseas Service, and "Farming Today," in the Home Service.

India and U. S. Exchange Dairy Breeding Stock

The second half of an international livestock exchange program between India and the United States was completed early this year when four head of selected dairy cattle from the United States Department of Agriculture's herd at Beltsville, Md., arrived at the Allahabad Agricultural Institute in India.

This exchange of dairy cattle began 2½ years ago when four purebred Red Sindhi cattle from the Institute were sent to the United States experimental farm at Beltsville, where they are being used to develop dairy cattle better able to withstand the higher temperatures of Southern States.

Of the animals sent to India, three are purebred Jerseys—two heifers and one bull. The fourth is a Jersey-Red Sindhi cross-bred bull that was sired by one of the Red Sindhi bulls sent in 1946 by the Institute.

The Red Sindhi is a milking strain of Brahman cattle, resistant to heat, pests, and drought. In general appearance and characteristics, it is similar to all other Brahman breeds, having the typical hump, drooping ears, and heavy dewlap.

For many years, the Allahabad Agricultural Institute has been trying to improve India's dairy cattle through cross-breeding. For the past 15 years, this work has almost exclusively involved crossing Red Sindhis with Jerseys, the latter having more heat tolerance than any other United States dairy breed.

International Conferences

Following are some of the international conferences of agricultural significance that are scheduled for 1949 and 1950. FOREIGN AGRICULTURE readers may be interested in some of them. In all cases, definite information regarding the place of meeting and the date is not available now, but revisions will be published from time to time as plans for the conferences are completed.

Organization	*Place*	*Date*
1949		
Agricultural Economists, International Conference of.	.....	August or September.
Chemistry, International Union of.	Amsterdam or U. S.	1949 or 1951.
Conservation and Utilization of Natural Resources, UN International Scientific Conference of.	.....	May 16.
Cotton Advisory Committee, International, (8th).	Belgium.....	April.
Dairy Congress, World.	Stockholm, Sweden.	Aug. 15–19.
Economic Cooperation, Inter-American.	Buenos Aires, Argentina.	Mar. 28.
Forestry and Timber Utilization Conference, Far East, FAO.	Mysore, India.....	Mar. 28.
Forestry Conference, World, FAO (3d).	Helsinki, Finland...	July.
Geographical Union, International, General Assembly, (17th Congress).	Libson.....	Apr. 8–15.
Grassland Congress, International (5th).	Noordwijk, Netherlands.	June 22–26.
Inter-American Conference on Agriculture (4th).	Montevideo, Uruguay.	Fall.
Livestock Production Conference, International.	Paris.....	
Ornithological Congress, International (10th).	U. S.....	1949 or 1950.
Pacific Science Congress (7th).	Auckland, New Zealand.	Feb. 2–22.
Rice Commission, International (1st).	.....	Mar. 7.
Rubber Study Group (6th).	Malaya.....	Mar. 28.
Rubber Study Group (Management Committee).	London.....	April or May.
Sugar Council, International.	London.....	March.
Universal Cotton Standards Conference, International.	.....	Spring.
1950		
Botanical Congress, International (7th).	Stockholm.....	July.
Cotton Advisory Committee, International (9th).	Washington, D. C..	Late in spring or early in summer.
Seed Testing Association, International Congress of (9th).	U. S.....	May.
Sericulture, International Conference of.	Possibly New York.	.....
Soil Science, International Congress of.	Amsterdam.....	.....

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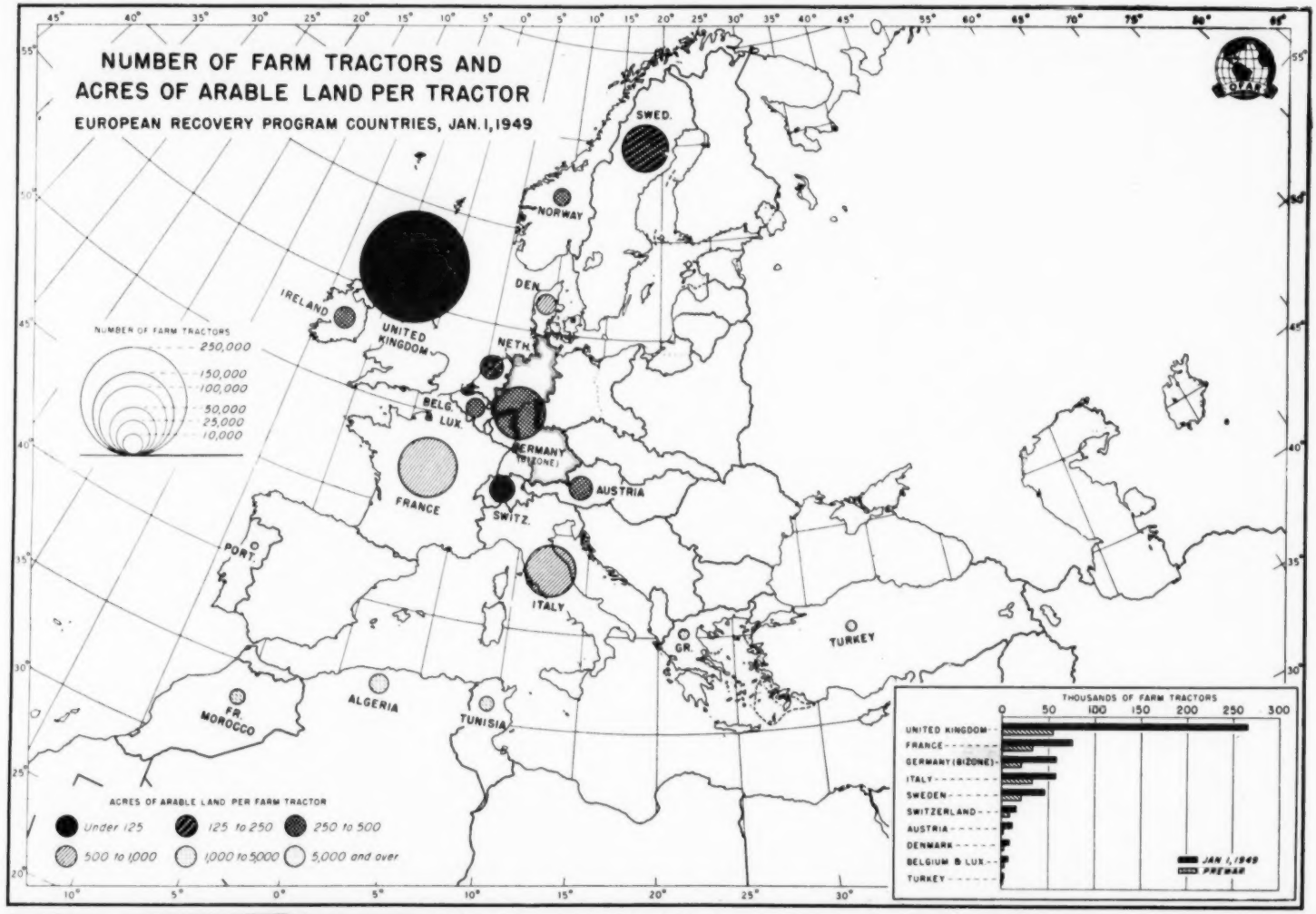
NUMBER OF FARM TRACTORS AND
ACRES OF ARABLE LAND PER TRACTOR
EUROPEAN RECOVERY PROGRAM COUNTRIES, JAN. 1, 1949
NUMBER OF FARM TRACTORS
250,000
150,000
100,000
50,000
25,000
10,000
SWED.
NORWAY
DEN.
IRELAND
UNITED KINGDOM
NETH.
BELG. & LUX.
GERMANY (BIZONE)
AUSTRIA
FRANCE
SWITZ.
PORT.
ITALY
GR.
TURKEY
FR. MOROCCO
ALGERIA
TUNISIA
ACRES OF ARABLE LAND PER FARM TRACTOR
Under 125
125 to 250
250 to 500
500 to 1,000
1,000 to 5,000
5,000 and over
THOUSANDS OF FARM TRACTORS
0
50
100
150
200
250
300
UNITED KINGDOM
FRANCE
GERMANY (BIZONE)
ITALY
SWEDEN
SWITZERLAND
AUSTRIA
DENMARK
BELGIUM & LUX.
TURKEY
JAN. 1, 1949
PREWAR